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(54) Pitch reduction on paper machine surfaces.

(57) The present invention is directed to compositions and methods for controlling pitch deposits derived from natural pulps on pulp and papermaking equipment surfaces. The method involves contacting the pulp and papermaking equipment surfaces with a composition containing a combination of a nonionic surfactant having a pitch dispersant value between 1 and 3, and a cationic polymer.

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Field of the Invention

This invention relates to the control of pitch on equipment surfaces which are in contact with an aqueous pulp suspension in paper making machines, and more particularly to a method for controlling or inhibiting the deposition of pitch onto paper making equipment surfaces in papermaking processes which use natural pulp.

Background of the Invention

Pulp and papermaking operations have always been concerned with the problem of organic deposits. These organic deposits comprise various sticky materials which may originate from the anionic resinous materials present in the wood from which the paper is made, or may originate from various inks or adhesive materials which are present in recycled paper which is frequently being used in current paper making processes. The organic deposit material originating naturally from the wood is referred to as pitch.

Pitch is known to accumulate at various points in the papermaking system. For example, pitch deposits have been known to block the paper machine felts and thus hinder drainage of the paper web. Pitch can adhere to the wires or drying cylinders causing it to pick holes in the paper. It may also deposit on press rolls, dryer fabric or other like equipment surfaces which come into direct or indirect contact with the aqueous pulp suspension, paper sheet or paper machine felts. In fact, all paper machine fabrics and many of the rolls which contact the fabrics or paper sheet will, from time to time, accumulate pitch deposits.

Many materials and techniques have been used in an attempt to eliminate these problems. Traditional techniques to control these deposits have been to shut down the production equipment to clean off the affected equipment parts with various solvents. Alternative methods involve the treatment of the aqueous pulp system with various chemical dispersants including inorganic materials such as talc or clay or organic dispersants such as anionic polymeric dispersants. The use of these conventional dispersants has been generally ineffective in closed systems where the system water is continuously recycled due to the accumulation and build-up of pitch in the system (known as cycling up). In such closed systems the pitch particles must be removed from the system water in a controlled way without being allowed to accumulate on the paper machine equipment such as the felts, rolls, or the pipe works.

One such method of control is to spray aqueous formulations of cationic polymers onto paper machine surfaces which are prone to pitch deposit formations to reduce the build-up of these deposits. However, this method has not been completely successful for controlling pitch deposits in pulp and papermaking processes which use natural pulp. As used herein, the terminology "natural pulp" refers to an aqueous pulp suspension which is obtained by kraft processes, sulfite processes, semichemical processes, groundwood processes and the like, and excludes those aqueous pulp suspensions which are derived from secondary fiber.

Summary of the Invention

It is an object of this invention to provide a method for inhibiting the deposition of pitch onto pulp and papermaking equipment surfaces in papermaking processes which use natural pulp.

It is another object of this invention to provide a novel composition which is useful for inhibiting the deposition of pitch onto pulp and papermaking equipment surfaces.

In accordance with the present invention, there has now been provided a method for inhibiting the deposition of pitch onto equipment surfaces in pulp and papermaking processes which uses natural pulp comprising applying to the equipment surfaces certain water-soluble, non-ionic surfactants having a pitch dispersant value (as hereinafter defined) between 1 and 3, and a water soluble cationic polymer, in amounts effective to inhibit the deposition of pitch.

Also provided in accordance with the present invention is a novel composition which is useful for inhibiting the deposition of pitch onto equipment surfaces in pulp and papermaking equipment comprising certain water-soluble, non-ionic surfactants having a pitch dispersant value between 1 and 3, and a water-soluble cationic polymer in a weight ratio of surfactant:polymer in the range 50:1 to 1:1.

Detailed Description

The present invention is directed to a novel composition and method for inhibiting the deposition of pitch onto pulp and papermaking equipment surfaces which are in contact with a natural pulp which comprises applying to the equipment surfaces a water-soluble, non-ionic surfactant having a pitch disper-

sant value between 1 to 3 and a water-soluble cationic polymer, in amounts effective to inhibit the deposition of pitch.

Pitch dispersant values refer to the ability of a compound to disperse natural pitch particles in an aqueous solution. Pitch dispersant values are considered to be an important feature of the compositions of this invention because it allows the cationic polymeric agents to effectively remove pitch deposits from pulp and papermaking equipment surfaces.

Suitable non-ionic surfactants for use in this generally include non-ionic surfactants which are water soluble or water dispersible, act as detergents and/or stabilizers for oil-in-water emulsions, and are capable of lowering surface and interfacial tension. More particularly, suitable nonionic surfactants for use in this invention have pitch dispersant values between 1 and 3, preferably between 1 and 2, as determined by the following Pitch Dispersant Test: into a beaker, add 1 to 5 grams of tall oil pitch, 1 to 2 grams of the nonionic surfactant to be evaluated, and blend until the mixture is homogenous. Add 10 to 20 ml of deionized water with continuous stirring. The pitch dispersant value of the nonionic surfactant is rated as follows:

- 1) A light tan solution is obtained with no evidence of dark brown, undissolved pitch particles present.
- 2) A light tan solution is obtained with a few small, dark brown, undissolved pitch particles present.
- 3) A dark tan solution is obtained having numerous, small, dark brown, undissolved pitch particles, present.
- 4) The water does not acquire any color and the tall oil pitch/nonionic surfactant mixture forms small lumps in the aqueous liquid.
- 5) The tall oil pitch/nonionic surfactant mixture agglomerates onto the sides of the beaker and the stirring mechanism.

The foregoing qualitative screening method may be more accurately quantified by filtering the solutions through a 60 to 100 mesh screen and calculating the amount of emulsified pitch by the following formula:

$$\% \text{ Emulsified Pitch} = \frac{(\text{g. Pitch/g. Surfactant}) - (\text{g. pitch retained in screen})}{(\text{g. Pitch/g. Surfactant})} \times 100$$

Optimum nonionic surfactants may be identified by the above method and reducing the screen size to 100 mesh opening. The nonionic surfactants of this invention will have a Pitch Dispersant Value of between 1 and 3 which generally corresponds to a % emulsified pitch in the range of 100% to 50%, preferably from 100% to 75% and most preferably from 100% to 90%.

It has now been discovered that only those non-ionic surfactants having the above-specified pitch dispersant values, are effective for controlling pitch deposits derived from natural pulp. By way of explanation rather than limitation, it is believed that the non-ionic surfactants of this invention inhibit pitch deposition by reducing the surface tension of the water with respect to the pitch particles thereby freeing them to adhere more easily to the cationic polymers which adhere to the pulp fibers and are thus removed from the papermaking system.

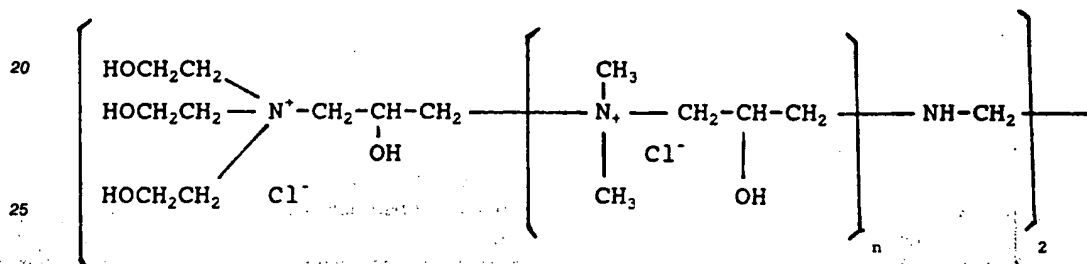
Not all nonionic surfactants exhibit pitch dispersant values from 1 to 3, and surprisingly, those nonionic surfactants that do possess pitch dispersant values from 1 to 3 are only effective for treating pitch derived from natural pulp. That is, the use of cationic polymers alone was effective for treating sticky material derived from secondary fiber pulps whereas, pitch deposits derived from natural pulp required the use of the nonionic surfactants of this invention.

Preferred water-soluble, non-ionic surfactants for use in this invention include, but are not limited to detergent type surfactants having good wetting ability such as alkyl phenols including nonyl phenols, or octyl phenols, ethoxylated dialkyl phenols which are commercially available from Rhone-Poulenc under the trademark Igepal DM, secondary alcohol ethoxylates which are commercially available from Union Carbide under the trademark Tergitol, block copolymers of alkylene oxides which are commercially available from BASF under the trademark Tetronic, and alkylphenoxypolyethoxyalkanols which are commercially available from Rohm and Haas under the trademark Triton X-100, and the like, and mixtures thereof. It is especially preferred that the non-ionic surfactants of this invention be non-foaming or defoaming type surfactants and that they be approved for use in food and drug type applications.

The present invention is of general applicability as regards the precise nature of the cationic polymer, and a considerable variety of different cationic polymers can be used, provided of course that they maintain their cationic charge in the system. Use of polyethylenimines is considered to be within this invention, as is use of various other polymeric materials containing amino groups such as those produced in accordance with the procedure disclosed in U.S. Patent Nos. 3,250,664, 3,642,572, 3,893,885 or 4,250,299; but it is generally preferred to use protonated or quaternary ammonium polymers. These preferred polymers include polymers obtained by reaction between an epihalohydrin and one or more amines, and polymers derived from thienically unsaturated monomers which contain a quaternary ammonium group. The

cationic polymers of this invention also include dicyandiamideformaldehyde condensates. Polymers of this type are disclosed in U.S. Patent No. 3,582,461, which is incorporated herein in its entirety. Either formic acid or ammonium salts, and most preferably both formic acid or ammonium chloride, may also be included as polymerization reactants. However, some dicyandiamideformaldehyde condensates have a tendency to agglomerate on felts and the like, even in the presence of cationic surfactants. One dicyandiamideformaldehyde type polymer is commercially available as Tinofix QF from Ciba Geigy Chemical Ltd. of Ontario, Canada and contains as its active ingredient about 50 weight percent of a polymer believed to have a molecular weight between about 20,000 and 50,000.

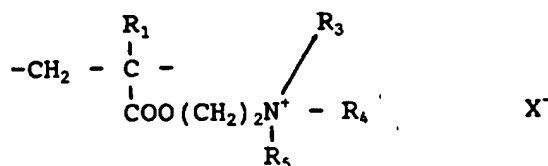
Among the quaternary ammonium polymers which are derived from epihalohydrins and various amines are those obtained by reaction of epichlorohydrin with at least one amine selected from the group consisting of dimethylamine, ethylene diamine, and polyalkylene polyamine. Triethanolamine may also be included in the reaction. Examples include those polymers obtained by reaction between a polyalkylene polyamine and epichlorohydrin, as well as those polymers obtained by reaction between epichlorohydrin, dimethylamine, and either ethylene diamine or a polyalkylene polyamine. A typical amine which can be employed is N,N,N',N'-tetramethylethylene-diamine as well as ethylene diamine used together with dimethylamine and triethanolamine. Polymers of this type include those having the formula:



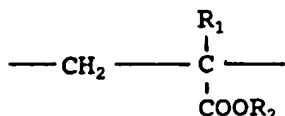
where n is from 0-500, although, of course, other amines can be employed.

The preferred cationic polymers of this invention also include those made by reacting dimethylamine, diethylamine, or methylethylamine, preferably either dimethylamine or diethylamine, with an epihalohydrin, preferably epichlorohydrin. Polymers of this type are disclosed in U.S. Patent No. 3,738,945, and Canadian Patent No. 1,096,070, which are incorporated herein in their entirety. Such polymers are commercially available as Agefloc A-50, Agefloc A-50HV, and Agefloc B-50 from CPS Chemical Co., Inc. of New Jersey, U.S.A. These three products reportedly contain as their active ingredients about 50 weight percent of polymers having molecular weights of about 75,000 to 80,000, about 200,000 to 250,000, and about 20,000 to 30,000, respectively. Another commercially available product of this type is Magnifloc 573C, which is marketed by American Cyanamide Company of New Jersey, U.S.A. and is believed to contain as its active ingredient about 50 weight percent of a polymer having a molecular weight of about 20,000 to 30,000.

Typical cationic polymers which can be used in the present invention and which are derived from ethylenically unsaturated monomers include homo- and copolymers of vinyl compounds such as vinyl pyridine and vinyl imidazole which may be quaternized with, say, a C<sub>1</sub> to C<sub>18</sub> alkyl halide, a benzyl halide, especially a chloride, or dimethyl or diethyl sulphate, or vinyl benzyl chloride which may be quaternized with, say, a tertiary amine of formula NR<sub>1</sub>R<sub>2</sub>R<sub>3</sub> in which R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are independently lower alkyl, typically of 1 to 4 carbon atoms, such that one of R<sub>1</sub>, R<sub>2</sub>, and R<sub>3</sub> can be C<sub>1</sub> to C<sub>18</sub> alkyl; allyl compounds such as diallyldimethyl ammonium chloride; or acrylic derivatives such as dialkyl aminomethyl(meth)acrylamide which may be quaternized with, say, a C<sub>1</sub> to C<sub>18</sub> alkyl halide, a benzyl halide or dimethyl or diethyl sulphate, a methacrylamido propyl tri(C<sub>1</sub> to C<sub>4</sub> alkyl, especially methyl) ammonium salt, or a (meth)acryloyloxyethyl tri(C<sub>1</sub> to C<sub>4</sub> alkyl, especially methyl) ammonium salt, said salt being a halide, especially a chloride, methosulphate, ethosulphate, or 1/n of an n-valent anion. These monomers may be copolymerized with a (meth)acrylic derivative such as acrylamide, an acrylate or methacrylate C<sub>1</sub> - C<sub>18</sub> alkyl ester or acrylonitrile or an alkyl vinyl ether, vinyl pyrrolidone, or vinyl acetate. Typically such polymers contain 10-100 mol % of recurring units of the formula:

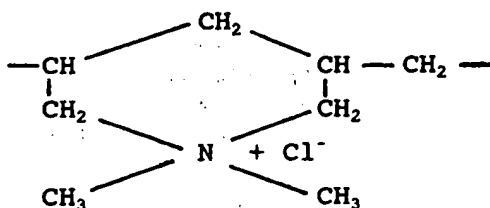


and 0-90 mol % of recurring units of the formula:



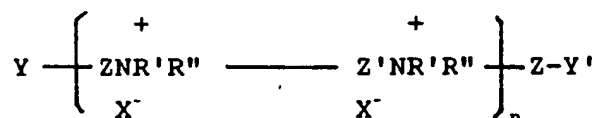
in which  $\text{R}_1$  represents hydrogen or a lower alkyl radical, typically of 1-4 carbon atoms,  $\text{R}_2$  represents a long chain alkyl group, typically of 8 to 18 carbon atoms,  $\text{R}_3$ ,  $\text{R}_4$  and  $\text{R}_5$  independently represent hydrogen or a lower alkyl group while  $\text{X}$  represents an anion, typically a halide ion, a methosulfate ion, an ethosulfate ion or  $1/n$  of a  $n$ -valent anion.

Other quaternary ammonium polymers derived from an unsaturated monomer include the homopolymer of diallyldimethylammonium chloride which possesses recurring units of the formula:



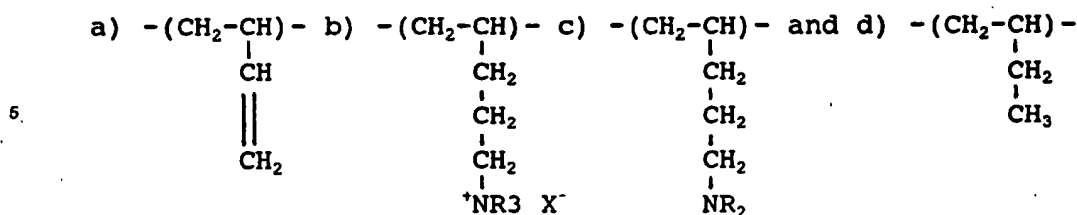
In this respect, it should be noted that this polymer should be regarded as "substantially linear" since although it contains cyclic groupings, these groupings are connected along a linear chain and there is no crosslinking.

Other polymers which can be used and which are derived from unsaturated monomers include those having the formula:



where  $\text{Z}$  and  $\text{Z}'$  which may be the same or different is  $-\text{CH}_2\text{CH}=\text{CHCH}_2-$  or  $-\text{CH}_2\text{-CHOHCH}_2-$ ,  $\text{Y}$  and  $\text{Y}'$ , which may be the same or different, are either  $\text{X}$  or  $-\text{NH}'\text{R}''$ ,  $\text{X}$  is a halogen of atomic weight greater than 30,  $n$  is an integer of from 2 to 20, and  $\text{R}'$  and  $\text{R}''$  (I) may be the same or different alkyl groups of from 1 to 18 carbon atoms optionally substituted by 1 to 2 hydroxyl groups; or (II) when taken together with  $\text{N}$  represent a saturated or unsaturated ring of from 5 to 7 atoms; or (III) when taken together with  $\text{N}$  and oxygen atom represent the  $\text{N}$ -morpholino group. A particularly preferred such polymer is poly-(dimethylbutenyl) ammonium chloride bis-(triethanol ammonium chloride).

Another class of polymer which can be used and which is derived from ethylenically unsaturated monomers includes polybutadienes which have been reacted with a lower alkyl amine and some of the resulting dialkyl amino groups are quaternized. In general, therefore, the polymer will possess recurring units of the formula:



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in the molar proportions a:b:c:d, respectively, where R represents a lower alkyl radical, typically a methyl or ethyl radical. It should be understood that the lower alkyl radicals need not all be the same. Typical quaternizing agents include methyl chloride, dimethyl sulfate and diethyl sulfate. Varying ratios of a:b:c:d may be used with the amine amounts (b+c) being generally from 10-90% with (a+c) being from 90%-10%. These polymers can be obtained by reacting polybutadiene with carbon monoxide and hydrogen in the presence of an appropriate lower alkyl amine.

Other cationic polymers which are capable of interacting with anionic macromolecules and/or sticky material in papermaking pulp may also be used within the scope of this invention. These are considered to include cationic tannin derivatives, such as those obtained by a Mannich-type reaction of tannin (a condensed polyphenolic body) with formaldehyde and an amine, formed as a salt, e.g. acetate, formate, hydrochloride or quaternized, as well as polyamine polymers which have been crosslinked, such as polyamideamine/polyethylene polyamine copolymers crosslinked with, say, epichlorohydrin. Natural gums and starches which are modified to include cationic groups are also considered useful.

The molecular weight of the most useful polymers of this invention is generally between about 2,000 and about 3,000,000, although polymers having molecular weights below 2,000 and above 3,000,000 may also be used with some success. Preferably with molecular weight of the polymer used is at least about 10,000, and is most preferably at least about 20,000. Preferably the molecular weight of the polymer used is about 300,000 or less, and is most preferably about 50,000 or less. The polymers most preferably have a molecular weight within the range of about 20,000 to 50,000. Mixtures of these polymers may also be used.

The polymers and surfactants of this invention may advantageously be supplied as liquid compositions comprising aqueous solutions of the polymer and/or surfactant. Polymer concentrations in the compositions may range from the relatively dilute solutions having polymer concentrations suitable for continuous application, up to the solubility or gelling limits of the polymer, but generally the compositions are relatively concentrated for practical shipping and handling purposes. Indeed, the liquid compositions may comprise additional materials which further the dissolution of the polymers so as to allow more concentrated compositions. An example of these materials are alkoxyethanols such as butoxyethanol. Aqueous compositions suitable for shipping and handling will generally contain between 5 and 50 weight percent, active, of the cationic polymer of this invention.

While the nonionic surfactants of this invention may be supplied as compositions separate from the cationic polymer compositions and then either applied to the equipment surfaces separately (e.g. by using separate shower systems) or mixed prior to application, it is preferred to provide aqueous compositions comprising the nonionic surfactant and the cationic polymer. The weight ratio of surfactant to polymer is such combined compositions is generally between about 50:1 to 1:50. Preferably the weight ratio of surfactant to polymer in the aqueous composition is between about 10:1 and about 1:1, especially where oils may potentially be present; and is most preferably about 1:1 for general application, although excess surfactant (e.g. a weight ratio of 1.1:1, or more) may be considered most suitable in the event oils might be present.

The most appropriate treatment dosage depends on such system factors as the amount of pitch particles present in the aqueous pulp suspension, and whether cleaning is continuous or periodic. Even liquid compositions comprising relatively high concentrations of a polymer of the invention (for example, 50%) may be employed at full strength (100% as the liquid composition), for example by spraying the undiluted liquid composition directly onto the felts. However, particularly where continuous treatment is practiced, the compositions may be advantageously diluted at the treatment location with clean fresh water or other aqueous liquid. Where necessary for water economy, a good quality process water may be adequate for dilution.

The advantages of this invention can be realized at application concentrations as low as 2 ppm of the polymer, especially where continuous treatment is practiced, and, as explained further below, sufficient surfactant to inhibit a build-up of deposits derived from the applied cationic polymer component. In some

cases, continuous treatment is not practical and treatment with the cationic polymers and surfactants of this invention may be periodic. For example, aqueous solutions of the polymer and surfactant may be sprayed on the equipment surfaces until the equipment surfaces are satisfactorily conditioned and the spray may then be discontinued until supplemental conditioning is needed to further inhibit the build-up of deposits.

5 Equipment surfaces which may be advantageously treated in accordance with this invention generally include any solid surface or screen surfaces having porous openings in the range of 30 mesh to 250 mesh such as the forming wires, press rolls or thickener equipment such as Decker wire, gravity couch roll thickener, disk filters and related equipment parts where pitch deposits are prone to form.

10 The following examples are provided to illustrate the present invention in accordance with the principles of this invention, but are not to be construed as limiting the invention in any way except as indicated in the appended claims. All parts and percentages are by weight unless otherwise indicated.

#### Example 1

15 Two grades of kraft linerboard were manufactured on a fourdriner paper machine. The first grade was manufactured with 100% natural kraft fiber. The second grade was manufactured with 100% secondary fiber. The additives used in the process were alum, rosin size and a polyacrylamide retention aid to improve first pass retention.

20 When manufacturing linerboard with 100% secondary fiber a cationic polymer was successfully used on the first press, unfelted roll to reduce press picking and reduce pitch deposits. This application was very effective. The application of a cationic coagulant is often used to eliminate press roll picking.

25 When 100% natural kraft linerboard was manufactured, deposits again formed and press picking continued on the roll. The cationic polymer which was effective for treating the 100% secondary fiber, did not reduce the press picking and deposit formation when the 100% natural kraft linerboard was manufactured.

Significant picking and deposit formation was eliminated on both grades by applying a cationic coagulant polymer blended with a nonionic surfactant.

#### Example 2

30 Various nonionic surfactants were evaluated using the Pitch Dispersant Value test. The results of this evaluation are illustrated in the following Tables 1-5.

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Table 1

Surfactant	Cloud Point (°F) *	N**	Pitch Dispersant Value***	HLB
Igepal CO-210	-	1.5	5	4.6
Igepal CO-520	-	5.0	3	10.0
Igepal CO-530	-	6.0	3	10.8
Igepal CO-710	158-165	10-11	5	13.6
Igepal CO-730	203-212	15	5	15.0
Igepal CO-850	>212	20	5	16.0
Igepal CO-887	>212	30	5	17.2
Igepal CO-897	>212	40	5	17.8
Igepal CO-997	>212	100	3	19.0
Igepal CO-430	-	4.0	4	8.8

Chemistry: Nonyl Phenol Ethoxylates (nonionic)

\* 1.0% aqueous solution

\*\* N = average number of moles ethylene oxide per mole alkylphenol group

\*\*\* 1 = Best 5 = Worst

HLB refers to Hydrophile-Lipophile Balance

Table 2

Product Name	Cloud Point (°F) *	N**	Pitch Dispersant	HLB
Igepal CA-210	-	1.5	5	4.8
Igepal CA-420	-	3.0	5	8.0
Igepal CA-520	-	5.0		10.0
Igepal CA-620	70-75	7.0	5	12.0
Igepal CA-630	146-153	9.0		13.0
Triton X-100	63-69	10.0	2	13.5
Igepal CA-720	187-194	12.5	5	14.6
Igepal CA-887	>212	30.0		17.4
Igepal CA-890	>212	40.0		18.0
Igepal CA-897	>212	40.0	5	18.0

Chemistry: Octylphenoxy polyethoxyethanols (nonionic)

Table 3

Surfactant	Cloud Point (°F)	N	Pitch Dispersant	HLB
Tergitol 15-S-3	<0	3.2	5	8.3
Tergitol 15-S-5	<0	5.0	5	10.6
Tergitol 15-S-7	37	7.3	4	12.4
Tergitol 15-S-9	60	8.9	3	13.3
Tergitol 15-S-12	90	12.3	2	14.7
Tergitol 15-S-15	>100	15.5	3	15.6
Tergitol 15-S-20	>100	20.1	5	16.4
Tergitol 15-S-30	>100	31.0	4	17.5
Tergitol 15-S-40	>100	41.1	5	18.0

Chemistry: Nonionic Surfactants containing the following components:

Alcohols, C11-15 Secondary, ethoxylated/68131-40-S

Poly(oxy-1,2-ethanediyl), a-hydroxy-/25322-68-3

Alcohols, C11-15 secondary/67989-40-6

Table 4

Surfactant	Cloud Point (°F)	MW	Pitch Dispersant	Chemical Type
Tergitol TMN-3	<0	312	5	1
Tergitol TMN-6	37	543	3	2
Tergitol TMN-10	77	683	3	2
Tergitol XJ	50	2550	5	3
Tergitol XD	76	3117	5	3
Tergitol XH	99	3740	5	3
Tergitol XL-80N	50	460	3	4
Tergitol MinFoam 2X	20	630	3	5
Tergitol MinFoam 1X	40	645	2	5
Tergitol D 683	21	1004	4	6
Tergitol MDS-42	43	6000	4	7

Chemistry: Nonionic Surfactants containing the following components:

1. Poly(oxy-1,2-ethanediyl), a-[3,5-dimethyl-1-(2-methylpropyl)-hexyl]-w-hydroxy-  
/60828-78-6  
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-/25322-68-3

2. Poly(oxy-1,2-ethanediyl), a-[3,5-dimethyl-1-(2-methylpropyl)-hexyl]-w-hydroxy-  
/60828-78-6
3. Water/ 7732-18-5, Poly(oxy-1,2-ethanediyl), a-hydroxy-/25322-68-3  
Oxirane, methyl-, polymer with oxirane, monobutyl ether/9038-95-3  
Oxirane, methyl-, polymer with oxirane, monoallyl ether/9041-33-2  
Oxirane, methyl-, polymer with oxirane/9003-11-6
4. Alcohols, C8-10, Ethoxylated propoxylated 68603-25-8  
Poly(oxy-1,2-ethanediyl), a hydro-w-hydrox 25322-68-3  
Octanol/111-87-5, Decanol/112-30-1
5. Alcohols, C11-15-secondary, ethoxylated propoxylated/68551-14-4  
Oxirane, methyl-, polymer with oxirane/9003-11-6  
Oxirane, methyl-, polymer with oxirane, monoallyl ether/9041-33-2  
2-Propen-1-ol/107-18-6, Poly(oxy-1,2-ethanediyl), a-hydro-w-hydrox 25322-68-3  
Alcohols, C11-15-secondary/67989-40-6
6. Oxirane, methyl-, polymer with oxirane, mono(nonylphenyl)ether, branched/68891-  
11-2  
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-/25322-68-3
7. Alcohols, C12-14, ethoxylated propoxylated/68439-51-0  
Oxirane, methyl-, polymer with oxirane/9003-11-6  
Oxirane, methyl-, polymer with oxirane, monoallyl ether/9041-33-2  
Poly(oxy-1,2-ethanediyl), a hydro-w-hydroxy-/25322-68-3

Table 5

Surfactant	Dispersant	HLB	Chemical Type
Pluronic L31	5	1-7	1
Pluronic L42	5		1
Pluronic L43	4	7-12	1
Pluronic L44	4	12-18	1
Pluronic L61	5	1-7	1
Pluronic L62LF	4	1-7	1
Pluronic L64	4	12-18	1
Pluronic L81	4	1-7	1
Pluronic L92	3	1-7	1
Pluronic L101	3	1-7	1
Ethofat 242/25	2		2

Chemistry: 1. Block copolymers of propylene oxide and ethylene oxide  
 2. Polyethylene glycol fatty and/or rosin acids (10 moles ethylene oxide added to one mole of acid)

As is apparent from the foregoing data in Tables 1-5, not all non-ionic surfactants are effective pitch dispersants. In this regard, it was surprising that nonionic surfactants having similar chemical structures and HLB values provided widely disparate pitch dispersant values.

# Claims

1. A method for inhibiting the deposition of pitch on equipment surface in pulp and papermaking equipment which uses natural pulp comprising applying to the equipment surface a water-soluble, non-ionic surfactant having a pitch dispersant value between 1 and 3 and a water-soluble cationic polymer, in amounts effective to inhibit the deposition of pitch.
2. A method according to Claim 1 wherein the water-soluble non-ionic surfactant is selected from the group consisting of ethoxylated dialkyl phenols, secondary alcohol ethoxylates, block copolymers of ethylene oxide and propylene oxide, octylphenoxy polyethoxy ethanol and mixtures thereof.
3. A method according to Claim 1 wherein the pitch dispersant value is between 1 and 2.
4. A method according to Claim 1 wherein the cationic polymer has a charge density in the range 0.1 to 10 meq/g.
5. A method according to Claim 1 wherein preferred 2 to 8 meq/g.
6. A method according to Claim 1 wherein dosage 500 to 1000 ppm.
7. A method according to Claim 1 wherein equipment surfaces are selected from the group consisting of press rolls, forming wires, Decker wire, gravity couch roll and disk filter.
8. A composition suitable for use in inhibiting the deposition of pitch in papermaking processes which use natural pulp comprising a water-soluble non-ionic surfactant having a pitch dispersant value in the range 1 to 3 and a water-soluble cationic polymer having a cationic charge in the range 0.1 to 10 meq/g. in a weight ratio of surfactant:polymer in the range of 50:1 to 1:1.
9. A composition according to Claim 7 wherein the non-ionic surfactant is selected from the group consisting of ethoxylated dialkyl phenols, secondary alcohol ethoxylates, block copolymers of ethylene oxide and propylene oxide, and octylphenoxy polyethoxy ethanol.
10. A composition according to Claim 7 wherein the nonionic surfactant has a pitch dispersant value in the range 1 to 2.
11. A composition according to Claim 7 wherein the weight ratio of surfactant:polymer is from 10:1 to 2:1.
12. A composition according to Claim 7 wherein the weight ratio of surfactant:polymer is 3:1.
13. A composition according to Claim 7 wherein the surfactant and polymer are dissolved in an aqueous solution and wherein the solution has a 40% solids content.
14. A composition according to Claim 7 wherein the surfactant and polymer are dissolved in an aqueous solution and wherein the solution has a 20% solids content.



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 93 25 0323

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claims	CLASSIFICATION OF THE APPLICATION (Int.Cls)
X	EP-A-0 359 590 (DEARBORN CHEMICAL COMPANY LTD)	1,7,8	D21H21/02 D21C9/08
Y	* the whole document *	2,9,11,12	
Y	US-A-5 139 616 (LING) * the whole document *	2,9,11,12	
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A	CA-A-1 150 914 (ALCHEM INC.) * the whole document *	1,8	
A	DATABASE PAPERCHEM THE INSTITUTE OF PAPER SCIENCE AND TECHNOLOGY, ATLANTA, GA, US AN 54-06267 SHPENZER, N. P. ET AL 'Colloidal and Chemical Properties of Surfactants Intended for Depitching of Sulfite Pulp' * abstract * & MEZHVUZ. SB. NAUCH. TR., SER. KHIM. TEKHNOL. TSELLYUL. NO. 6: 32-36 (1979). [RUSS.]	1	
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 17 February 1994	Examiner Songy, O
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X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons Δ : member of the same patent family, corresponding document	

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